REMARKS

Claims 1, 4, 8, 63, and a second occurrence of claim 76 have been canceled without prejudice. Note that there was no claim 63 originally filed nor subsequently added. Claims 5, 6, 44, 45, 49, 52, 54, 64, and 65 have been amended. These amendments find support in various parts of the specification (see, for example, claim 1 and Fig. 1, as originally filed, at page 3, lines 6-21, at page 3, lines 31 to page 4, lines 23) and thus no new matter is introduced. Claims 83-85 have been added. These additions find support in various parts of the specification (see, for example, claim 1 and Fig. 1, as originally filed, at page 3, lines 6-21, at page 3, lines 31 to page 4, lines 23) and thus no new matter is introduced. Claims 2-3, 5-7, 9-62, and 64-85 are pending. Note that the first occurrence of claim 76 is still pending. The applicants also note that the Examiner has applied a new reference, Sitte (U.S. 5,469,150, hereinafter Sitte), which is applied to those limitations to which "Official Notice" was previously taken. The applicants' amendments herein take into account the Sitte reference. Favorable reconsideration of this application is respectfully requested in light of the following detailed discussion.

Claim Rejections – 35 U.S.C. § 103

1. The Examiner has rejected claims 1-3, 5, 45-48, and 64-65 under 35 U.S.C. § 103(a) as being obvious over Diekhans et al. (U.S. 5,043,861, hereinafter Diekhans) in view of Sitte. The Examiner asserts that:

As for independent claims 1 and 45, Diekhans discloses a comprehensive input/output interface circuit for interfacing a process or machine controller with a sensor monitoring a condition within said process or machine or an actuator acting to modify said process or machine with a controller receiving inputs from said sensor or sending commands to said actuator [col. 1, lines 7-20, "The invention relates.. the output contacts."]; said interface comprising:

first and second electrical terminals for coupling with said sensor or said actuator [the terminals are inherent to the common plug; col. 2, lines 7-line, "The contacts, sensors.., input/output circuit board."];

a plurality of operation mode circuits providing different signal type input and output functions including a digital input function, a digital output function, an analog input function, and an analog output function [col. 1, lines 7-20, "The invention relates" the output contacts."]; and

means for the controlling activation and deactivation of different ones of said operation mode circuits to provide a selected ones of said signal type input and output functions [col. 2, lines 10-18, "Drive of the input and output... during multiplex operation."].

The Examiner further asserts that, although obvious to one of ordinary skill in the art, Diekhans does not explicitly disclose coupling with a sensor or actuator exclusively through only said first and second electronic terminals. Sitte teaches a sensor having two terminals [col. 1, lines 39-54, "U.S. Pat No....over a wide range."]. Such a sensor would inherently be coupled to a control circuit through only two terminals (e.g. first and second terminals). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify

Diekhans by coupling with a sensor or actuator exclusively through only said first and second electronic terminals, because this would allow for coupling with a two-terminal sensor such as that disclosed by Sitte.

As for claims 2 and 46, Diekhans discloses the interface of claims 1 and 45 wherein said means for controlling activation and deactivation includes a microcontroller [col. 1, lines 16-17, "input or output circuits"; col. 2, lines 10-18, "Drive of the input and output... during multiplex operation."].

As for claims 3 and 47, Diekhans discloses the interface of claims 2 and 46, wherein said microcontroller is adapted to receive control signals from an external controller [processor CPR, Fig. 1; col. 2, lines 58-66, "Fig. 1 is a general... provided on the processor."].

As for claims 5 and 48, Diekhans discloses the interface of claims 1 and *45* wherein said means for controlling activation and deactivation includes a microcontroller that is adapted to receive control signals from an external controller [col. 1, lines 16-17, "input or output circuits"; col. 2, lines 10-18, "Drive of the input and output... during multiplex operation."].

As for claim 64, Diekhans discloses the interface of claim 1, further comprising means for controlling current delivered to or drawn by said first external device by providing a substantially constant current to said first external device [col. 1, line 62 — col. 2, line 6, "The users connected to...input processing is assured."].

As for claim 65, Diekhans discloses the interface of claim 64, wherein said first external device comprises an actuator [col. 1, lines 62-63, "The users connected to the outputs... or heat generators.."].

The applicants, however, have canceled independent claim 1 and, in place of claim 1, have added independent claim 83, from which claims 2, 3, 5, and 64-65 now depend. Therefore, the rejection of claim 1 is moot. Also, the applicants have amended independent claim 45, from which claims 46-48 directly or indirectly depend.

After thoroughly reading both the Diekhans and the Sitte references, the applicants can find no disclosure in Diekhans, Sitte, or a combination of both Diekhans and Sitte, where at least the limitations of claim 83 (i.e., first and second electrical terminals electrically connecting a single sensor or a single actuator, but not both simultaneously, to said interface circuit, wherein said interface circuit is electrically connected to said single sensor or said single actuator exclusively and directly via only said first and second terminals; and a plurality of operation mode circuits that automatically sense whether said sensor or said actuator is connected to said interface and, subsequently, automatically and directly provide different signal type input and output functions including a digital input function, a digital output function, an analog input function, and an analog output function, between said interface circuit and said sensor or said actuator) are taught or suggested.

Instead the applicants find that the cited references teach that more than a single sensor or actuator (for example, Diekhans' Fig. 1 shows PB simultaneously connected to at least nine I/O devices FG, VM1, RS, AG1, KG1, KG2, VL1, NG, and VA, and Sitte's Fig. 1 shows a bus 10 that is simultaneously connected to more than six I/O devices) are simultaneously connected to their interface circuits, that these references teach that their sensors and actuators are not connected exclusively and directly (Sitte's bus 10 requires each port in the programmable logic controller 12 and each I/O device, like 14, 18, and 27, to indirectly be "smart" or to indirectly communicate via a protocol on the bus 10 through a "smart" device) to only first and second terminals, that these references do not teach a plurality of operation mode circuits that automatically sense (for example, the applicants can find nowhere in Diekhans where the individual PLC board PB automatically and internally senses) if the single I/O device that is connected to that port is a sensor or actuator and, if so, automatically and directly provide different input and output functions.

Therefore, independent claim 83 and its dependent claims 2-3, 5, and 64-65 are patentable over Diekhans in view of Sitte, as the inventions defined thereby are not suggested within either Diekhans or Sitte, nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Accordingly, favorable consideration of claim 83 and reconsideration of claims 2-3, 5, and 64-65 are respectfully requested.

Regarding independent claim 45, the applicants have thoroughly read both the Diekhans and the Sitte references, and the applicants can find no disclosure in Diekhans, Sitte, or a combination of both Diekhans and Sitte where these references teach or suggest the invention of claim 45 (i.e., electrically connecting a single sensor or a single actuator, but not both simultaneously, with first and second electrical terminals of an interface having a plurality of operation mode circuits that automatically sense whether said sensor or said actuator is connected to said interface and, subsequently, automatically and directly provide different signal type input and output functions including a digital input function, a digital output function, an analog input function, and an analog output function, between said interface and said sensor or said actuator, wherein said interface is electrically connected to said single sensor or said single actuator exclusively and directly via only said first and second terminals).

Instead, the applicants find (as found above in the detailed response to the 35 U.S.C. § 103 rejection of claims 1, 2-3, 5, and 64-65) that Diekhans and Sitte teach that more than a single sensor or actuator are connected to the interface circuit simultaneously, that these references teach that their sensors and actuators are not connected exclusively and directly to only first and second terminals, that these references do not teach a plurality of operation mode circuits that automatically sense whether their sensors or actuators are connected, and, if so, automatically and directly provide different input and output functions. Please note that independent claim 45 contains the same limitations as claim 83 and therefore the above detailed discussion, regarding the cited references, applies to claim 45.

Therefore, independent claim 45 and claims 46-48, which depend directly or indirectly from claim 45, of the claimed application, are patentable over Diekhans in view of Sitte, as the inventions defined thereby are not suggested within either Diekhans or Sitte, nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Accordingly, favorable reconsideration of claims 45-48 is respectfully requested.

2. The Examiner has rejected claims 52 and 54 under 35 U.S.C. 103(a) as being obvious over Diekhans in view of Sitte and in further view of Johnson (U.S. Patent No. 5,264,958, hereinafter Johnson). The Examiner asserts that:

As for claims 52 and 54, neither Diekhans nor Sitte specifically disclose the use of a protection circuit. However, Johnson discloses the use of a protection circuit with an interface for reducing damage to said interface and connected devices that could otherwise occur as a result of misconnecting or miswiring said interface to an external device [col. 4, lines 31-43, "Referring now to Fig. 2... from the signals."].

The Examiner further asserts that, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Diekhans and Sitte by adding a protection circuit for reducing damage to said interface or to said first device or said second device that would otherwise result in damage to said interface as a result of misconnecting or miswiring said interface to one of said first or second external devices, because

this would also provide protection from an inordinately high input voltage or a short circuit, as taught by Johnson [col. 4, lines 31-43, "Referring now to Fig. 2... from the signals."].

The applicants, however, have canceled independent claim 1, from which claims 52 and 54 depend, and, in place of claim 1, have added independent claim 83, from which claims 52 and 54 now depend. Also, the applicants have amended independent claims 52 and 54, to more correctly identify said first or second external devices as said sensor or said actuator.

The applicants traverse the rejection of claims 52 and 54 as unpatentable over Diekhans in view of Sitte and in further view of Johnson. These claims now depend from claim 83 and are patentable at least on that basis. The rejections should therefore be withdrawn.

Moreover, the applicants find Johnson to be directed to a universal communications interface adaptable for a plurality of interface standards that utilizes at least a single ended line receiver 30 and a single ended driver 34 that are connected to multiple inputs and multiple outputs through input connector 20. Therefore, independent claims 52 and 54 are patentable over Diekhans in view of Sitte and further in view of Johnson, as the inventions defined thereby are not suggested within either Diekhans, Sitte, or Johnson nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Accordingly, favorable reconsideration of claims 52 and 54 is respectfully requested.

3. The Examiner has rejected claims 56 and 57 under 35 U.S.C. 103(a) as being obvious over Diekhans in view of Sitte and in further view of McLeish et al. (U.S. Patent No. 5,014,238, hereinafter McLeish).

The Examiner asserts that:

As for claims 56 and 57, neither Diekhans nor Sitte specifically disclose the use of an input current detection circuit that detects the state of a sensor directly rather than detecting the sensor voltage. However, McLeish discloses the use of an input current detection circuit that detects the state of a sensor directly rather than detecting the sensor voltage [col. 4, lines 3 1-43, "Referring now to Fig. 2...from the signals."; col. 5, lines 51-57, "Define the sensor type... current."]. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teachings of Diekhans and Sitte by using an input current detection circuit that detects the state of a sensor directly rather than detecting the sensor voltage, because this would provide for electrical protection from EMI interference and common mode voltage suppression, as taught by McLeish [col. 4, lines 31-43, "Referring now to Fig. 2... from the signals."].

The applicants, however, have canceled independent claim 1, from which claims 56 and 57 indirectly depended, and, in place of claim 1, have added independent claim 83, from which claims 56 and 57 now indirectly depend. The applicants traverse the rejection of claims 56 and 57 as unpatentable over Diekhans in view of Sitte and in further view of McLeish. These claims

now indirectly depend from claim 83 and are patentable at least on that basis. The rejections should therefore be withdrawn.

Moreover, the applicants find in the McLeish reference (see, for example, Fig. 1) that up to 32 field devices 4 are connected to each signal conditioning circuit 18 that is connected to a multiplexer MUX 18, and it appears to the applicants that if multiple MUXs are added to the DATA BUS, then each MUX can support up to 32 additional field devices 4. Therefore, claims 56 and 57 are patentable over Diekhans in view of Sitte and further in view of McLeish, as the inventions defined thereby are not suggested within either Diekhans, Sitte, or McLeish nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Accordingly, favorable reconsideration of claims 56 and 57 is respectfully requested.

4. The Examiner has rejected claims 6, 7, 9-44 and 49-51, 53, 55, 58-62, 79 and 81 under 35 U.S.C. 103(a) as being [anticipated] unpatentable by McLeish et at. (U.S. Patent No. 5,014,238) in view of Sitte.

The Examiner asserts that:

As for claim 6, McLeish discloses an electrical input and output (I/O) interface comprising:

a first port for coupling said interface to a first external device [col. 4, lines 30-34, "A field device 4... or field device 4."];

a second port for coupling said interface with a second device [col. 4, lines 30-34, "A field device 4... or field device 4."];

an operating circuit communicating with a first signal set at said first port and communicating a second signal set at said second port and performing an operation on one of said first signal set and said second signal set as an input and generating the other one of said first signal set and said second signal set as an output [col. 4, lines 30-58, "A field device 4... of keyboard 10."; col. 5, lines 25-28, "The input-output device...referred to above."]; and

an operation selector selecting said operation performed by said operating circuit from among a plurality of operations [col. 5, lines 25-68, "The input-output device...base and the span."].

McLeish does not specifically disclose a first port having only first and second terminals for exclusively coupling an interface to a first external device. Sitte teaches a sensor having two terminals [col. 1, lines 39-54, "U.S. Pat No... over a wide range."]. Such a sensor would inherently be coupled to a control circuit through only two terminals (e.g. first and second terminals). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify McLeish providing a first port with only first and second terminals for exclusively coupling the interface to a first external device, because this would allow for coupling with a two-terminal sensor such as that disclosed by Sitte.

The Examiner further asserts that for claim 7, McLeish discloses the interface of claim 6, wherein said interface is a comprehensive universal configurable interface for interfacing a

multiplicity of analog, digital, voltage and current based signals over a multiple orders of magnitude signal range between a controller and a transducer [col. 4, lines 30-55, "A field device...referred to above."].

As for claims 9-13, McLeish discloses the interface in claim 6, wherein said first external device comprises either a sensor or an actuator of a machine or process and said sensor or actuator are used to monitor or control said machine or process [col. 5, lines 25-68, "The input-output device...base and the span."].

As for claim 14, McLeish discloses the interface in claim 6, wherein said first external device comprises a sensor generating a voltage signal [col. 5, lines 5 1-57, "Define the sensor... - current."].

As for claim 15, McLeish discloses the interface in claim 6, wherein said first external device comprises a sensor generating a current signal [col. 5, lines 51-57, "Define the sensor... - current."].

As for claim 16, McLeish discloses the interface in claim 6, wherein said second device comprises an external controller [MP 3, Fig. 2].

As for claim 17, McLeish discloses the interface in claim 6, wherein said second device consists of a controller and an isolation circuit interposed between said interface and an external controller [col. 5, lines 49-58, "The signal conditioning... of keyboard 10."].

As for claims 18-20, McLeish discloses the interface in claim 6, wherein said second port includes a third terminal for communicating data, control or commands, and clock [col. 4, lines 30-55, "A field device.., referred to above."].

As for claim 21, McLeish does not specifically disclose the use of a fifth terminal. However, McLeish discloses the use of multiple terminals for communicating data, communicating control or commands and for communicating clock [col. 4, lines 30-55, "A field device... referred to above."]. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify McLeish to include five terminals, the third terminal for communicating data, the fourth terminal for communicating control or commands and the fifth terminal for communicating clock, because this is one of several known and obvious design choices.

As for claim 22, McLeish discloses the interface in claim 6, wherein said operating circuit including a plurality of different operating mode circuits [col. 4, lines 9-22, "The input-output device...also be utilized."].

As for claim 23, McLeish discloses the interface in claim 6, wherein said operating circuit includes means for configuring said operating circuit in a particular mode of operation [col. 5, lines 25-68, "The input-output device.., base and the span."].

As for claim 24, McLeish discloses the interface in claim 23, wherein said mode of operation selected from the set of operating modes consisting of a digital input signal mode, a digital output signal mode, an analog input signal mode, an analog output signal mode, and combinations thereof [col. 4, lines 30-55, "A field device...referred to above."].

As for claim 25, McLeish discloses the interface in claim 23, wherein said mode of operation selected from the set of operating modes consisting of a Mode 1 operating mode, a Mode 2 operating mode, a Mode 3 operating mode, a Mode 4 operating mode, a Mode 5

operating mode, a Mode 6 operating mode, a Mode 7 operating mode, and combinations thereof [col. 5, lines 25-68, "The input-output device...base and the span."].

As for claim 26, McLeish discloses the interface in claim 6, wherein said operation selector selects an operating mode from among a plurality of defined modes of operation [col. 5, lines 25-68, "The input-output device.., base and the span."].

As for claim 27, McLeish discloses the interface in claim 6, wherein said operation selector comprising a microcontroller [col. 4, lines 9-22, "The input-output device... also be utilized."].

As for claim 28, McLeish discloses the interface in claim 6, wherein said operation selector comprising a microcontroller coupled with at least one analog-to-digital converter for converting analog signals to digital signals for processing by said microcontroller [col. 1, lines 36-47, "Furthermore, U.S. Pat... and digital signals."]

As for claim 29, McLeish discloses the interface in claim 6, wherein said operation selector microcontroller having a plurality of control lines for receiving input signals and a plurality of output signals to influence the operation performed by said operating circuit [Fig. 1; col. 4, lines 30-55, "A field device...referred to above."].

As for claim 30, McLeish discloses the interface in claim 6, wherein said plurality of operations including a digital input signal mode, a digital output signal mode, an analog input signal mode, an analog output signal mode, and combinations thereof [col. 4, lines 30-55, "A field device...referred to above."; col. 5, lines 25-68, "The input-output device...base and the span."].

As for claim 31, McLeish discloses the interface in claim 6, wherein said plurality of operations including a mode of operation selected from the set of operating modes consisting of a Mode 1 operating mode, a Mode 2 15 operating mode, a Mode 3 operating mode, a Mode 4 operating mode, a Mode 5 operating mode, a Mode 6 operating mode, a Mode 7 operating mode, and combinations thereof [col. 5, lines 25-68, "The input-output device.., base and the span."].

As for claim 32, McLeish discloses the interface in claim 6, wherein said operation selector is operative to activate portions of said operating circuit and to deactivate portions of said operating circuit to define an active circuit that performs a selected operation [col. 4, lines 30-55, "A field device... referred to above."; col. 5, lines 25-68, "The input-output device...base and the span."].

As for claim 33, McLeish discloses the interface in claim 6, wherein said operating circuit comprises a plurality of modular circuits each for performing a predetermined signal processing function with respect to input signals and output signals, and said operation selector being operative to activate ones of said modules and to deactivate other ones of said modules to define one or more active modules that performs a selected operation [col. 4, lines 9-22, "The input-output device...also be utilized."; col. 5, lines 25-68, "The input-output device...base and the span."].

As for claim 34, McLeish discloses the interface in claim 6, wherein said operation selector is operative to activate said modules to process a signal of a particular signal type [col. 4, lines 30-55, "A field device...referred to above."; col. 5, lines 25-68, "The input-output device.., base and the span."].

As for claim 35, McLeish discloses the interface in claim 6, wherein said particular signal type comprises either an input signal type or an output signal type or both [col. 4, lines 30-55, "A field device...referred to above."].

As for claim 36, McLeish discloses the interface in claim 6, wherein said interface communicates an output command to one of said first or second device commanding said external device to operate in a status corresponding to said command; and monitoring the actual operating status of said external device; said actual operating status being the same or different from the commanded status [col. 5, lines 34-5 6, "Means 20 for generating... gallons per minute."].

As for claims 37-39, McLeish discloses the interface in claim 6, wherein one of said first and second device comprises an actuator and the other of said first and second device comprise a sensor [col. 5, lines 25-68, "The input-output device...base and the span."].

As for claims 40 and 41, McLeish discloses the interface in claim 6, wherein said interface further comprising input current detection means for directly detecting a sensor current rather than detecting sensor voltage determine sensor state to thereby reduce the effects of induced electrical noise appearing on sensor voltage on conductors coupling said sensor to said interface [col. 4, lines 30-5 5, "A field device.. referred to above."; col. 5, lines 25-68, "The input-output device.., base and the span."].

As for claim 42, McLeish discloses the interface in claim 6, wherein: said interface is a comprehensive universal configurable interface for interfacing a

multiplicity of analog, digital, voltage, and current based signals over a multiple orders of magnitude signal range between a controller and a transducer [col. 4, lines 30-5 5, "A field device... referred to above."];

said first external device comprises either a sensor or an actuator of a machine or process [col. 5, lines 25-68, "The input-output device...base and the span."];

said first external device comprises a sensor generating a voltage or a current signal [col. 5, lines 25-68, "The in put-output device.., base and the span."];

said second device comprises a controller and an isolation circuit interposed between said interface and said external controller [col. 3, lines 64-66, "Each MIP 3... input output device 2."; col. 5, lines 49-58, "The signal conditioning... of keyboard 10."];

said second port includes a third terminal for communicating at least one of data, control or commands, and clock [col. 4, lines 30-55, "A field device... referred to above."]

said operating circuit includes a plurality of different operating mode circuits, and said operating circuit includes means for configuring said operating circuit to operate in a particular mode of operation [col. 4, lines 9-22, "The input-output device.., also be utilized."; col. 5, lines 25-68, "The input-output device.., base and the span."];

said mode of operation comprises a digital input signal mode, a digital output signal mode, an analog input signal mode, an analog output signal mode, or combinations thereof [col. 4, lines 30-55, "A field device...referred to above."; col. 5, lines 25-68, "The input-output device...base and the span."];

said operation selector comprises a microcontroller coupled with at least one analog-to--digital converter for converting analog signals to digital signals for processing by said microcontroller [col. 1, lines 36-47, "Furthermore, U.S. Pat... and digital signals."];

said operation selector being operative to activate portions of said operating circuit and to deactivate other portions of said operating circuit to define an active circuit that performs a selected operation [col. 4, lines 30-55, "A field device...referred to above."; col. 5, lines 25-68, "The input-output device... base and the span."].

As for claim 43, McLeish discloses the interface in claim 6, wherein:

said operating circuit comprising a plurality of modular circuits each for performing a predetermined signal processing function with respect to input signals and output signals, and

said operation selector being operative to activate ones of said modules and to deactivate other ones of said modules to define one or more active modules that performs a selected

operation [col. 4, lines 30-5 5, "A field device...referred to above."; col. 5, lines 25-68, "The input-output device...base and the span."];

said operation selector being operative to activate said modules to process a signal of a particular signal type [col. 4, lines 30-55, "A field device...referred to above."; col. 5, lines 25-68, "The input-output device.., base and the span."];

said interface further comprising input current detection means for directly detecting a sensor current rather than detecting sensor voltage determine sensor state to thereby reduce the effects of induced electrical noise appearing on sensor voltage on conductors coupling said

sensor to said interface [col. 4, lines 30-55, "A field device...referred to above."; col. 5, lines 25-68, "The input-output device... base and the span."].

As for claims 53 and 55, McLeish discloses the interface in claim 6, wherein said interface further comprising a protection circuit for reducing damage to said interface or to said first device or said second device that would otherwise result in damage to said interface as a result of mis-connecting or miswiring said interface to one of said first or second external devices [col. 4, lines 49-58, "The signal conditioning... of keyboard 10."].

As for claims 58 and 59, McLeish discloses the interface in claim 55, wherein said interface further comprising input current detection means for directly detecting a sensor current rather than detecting sensor voltage determine sensor state to thereby reduce the effects of induced electrical noise appearing on sensor voltage on conductors coupling said sensor to said interface [col. 4, lines 30-55, "A field device... referred to above."; col. 5, lines 25-68, "The input-output device.., base and the span."].

As for claims 60 and 62, McLeish discloses the interface in claim 6, wherein said interface further comprising means for measuring power, both real and imaginary, by dynamically switching between voltage measurements and current measurements [col. 5, lines 25-68, "The input-output device.., base and the span."].

As for claim 61, McLeish discloses the interface in claim 6, wherein said interface further comprising: a voltage measuring circuit and a current measurement circuit each coupleable to a load, a switching circuit for dynamically switching between said voltage measurement circuit and said current measurement circuit; said combination of voltage measurements and said current

measurements permitting measurement of power consumed by said load [col. 5, lines 25-68, "The input-output device.., base and the span."].

As for claim 79, McLeish discloses the interface in claim 6, wherein said interface is formed as a single integrated device within a common enclosure [input-output device 2, Fig. 2].

As for claim 81, McLeish discloses the interface in claim 6, wherein said selectable operation of said interface to inter-operate with a plurality of different sensors, actuators, and other transducers materially reducing design and engineering time associated with designing, assembling, and debugging operation of a system including said interface [col. 2, lines 1-14, "Present digital... or output signals."].

As for claim 44, McLeish discloses an electrical input and output (I/O) interface comprising:

a first port for coupling said interface to a first external device [col. 4, lines 30-34, "A field device 4... or field device 4."];

a second port for coupling said interface with a second device [col. 4, lines 30-34, "A field device 4... or field device 4."]; and

an operating circuit communicating with a first signal set at said first port and communicating a second signal set at said second port and performing an operation on one of said first signal set and said second signal set as an input and generating the other one of said first signal set and said second signal set as an output [col. 4, lines 30-58, "A field device 4... of keyboard 10."; col. 5, lines 25-28, "The input-output device.. referred to above."];

said operating circuit receiving an input from an external micro-controller directing a configuration of said operating circuit [col. 3, lines 64-66, "Each MP 3 is...input output device 2."].

The Examiner further asserts that McLeish does not specifically disclose a first port having only first and second terminals for exclusively coupling an interface to a first external device. Sitte teaches a sensor having two terminals [col. 1, lines 39-54, "U.S. Pat No... over a wide range."]. Such a sensor would inherently be coupled to a control circuit through only two terminals (e.g. first and second terminals). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify McLeish providing a first port with only first and second terminals for exclusively coupling the interface to a first external device, because this would allow for coupling with a two-terminal sensor such as that disclosed by Sitte.

As for claim 49, McLeish discloses an interface comprising:

an output circuit that communicates an output command to an external device coupled with said interface commanding said external device to operate in a state corresponding to

said command [col. 3, line 67 — col. 2, line 3, "The input-output device...particularized herein."]; and

a monitor circuit that monitors the actual operating state of said external device [col. 5, lines 25-28, "The input-output device...4 referred to above."]; said actual operating state being the same or different from the commanded state [col. 6, lines 34-5 6, "Means 20 for generating... gallons per minute."].

McLeish does not specifically disclose a first port having only first and second terminals for exclusively coupling an interface to a first external device. Sitte teaches a sensor having two terminals [col. 1, lines 39-54, "U.S. Pat No....over a wide range."]. Such a sensor would inherently be coupled to a control circuit through only two terminals (e.g. first and second terminals). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify McLeish providing a first port with only first and second terminals for exclusively coupling the interface to a first external device, because this would allow for coupling with a two-terminal sensor such as that disclosed by Sitte.

As for claim 50, McLeish discloses the interface circuit in claim 49, wherein said actual operating state is different from the commanded state [col. 6, lines 34-5 6, "Means 20 for generating... gallons per minute."].

As for claim 51, McLeish discloses the interface in claim 49, wherein said state corresponds to a status [col. 5, lines 25-28, "The input-output device... 4 referred to above."].

The applicants, however, have amended independent claim 6 to more distinctly claim an electrical input and output (I/O) interface. After thoroughly reading both the McLeish and the Sitte references, the applicants can find no disclosure in McLeish, Sitte, or a combination of both McLeish and Sitte where at least the limitations of claim 6 (i.e., first and second electrical terminals electrically connecting a single first external device to said I/O interface, wherein said interface is electrically connected to said first external device exclusively and directly via only said first and second terminals; and an automatic operation selector that automatically selects the

operation that is performed directly by said operating circuit from among a plurality of internal to said operations) are taught or suggested.

Instead, the applicants find, as stated above in the response to the 35 U.S.C. § 103 rejection of claim 1 that Sitte, and in 35 U.S.C. § 103 rejection of claims 56 and 57 that McLeish teach more than a single external device being simultaneously connected to their interface circuits and that the cited references teach that their external devices are not connected exclusively and directly to only first and second terminals. Also, the cited references do not teach a plurality of operation mode circuits, which automatically, and internally to the interface, sense the operation to be performed. In other words, the cited references appear to communicate operation mode circuits by providing a specific operating state that is hard wired into the individual I/O circuits, or by providing the operation mode circuits via the use of an external computer or programmable logic controller.

Consequently, the applicants respectfully submit that independent claim 6 and claims 7, 9-43, 53, 55, 58-62, 79, and 81, which directly or indirectly depend from claim 6, are patentable over McLeish in view of Sitte, as the inventions defined thereby are not suggested within either McLeish or Sitte, nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Therefore, claims 6, 7, 9-43, 53, 55, 58-62, 79, and 81 of the claimed invention should be allowed over McLeish in view of Sitte. Accordingly, favorable reconsideration of claims 6, 7, 9-43, 53, 55, 58-62, 79, and 81 is respectfully requested.

Regarding independent claim 44, the applicants have amended claim 44 to more distinctly claim an electrical input and output (I/O) interface. Further, claim 44 recites the limitations of "first and second electrical terminals electrically connecting only single a first external device to said I/O interface, wherein said interface is electrically connected to said first external device exclusively and directly via only said first and second terminals; and said operating circuit receiving an input from an external micro-controller directing an operating circuit configuration from operating circuit configurations internal to said operating circuit."

In contrast, the applicants find, as stated above in the responses to the 35 U.S.C. § 103 rejections of claims 1, 56, and 57 that Sitte and McLeish teach that more than a single external device is connected to their I/O interface. Also, the cited references teach that their external devices are not connected exclusively and directly to only first and second terminals, and that the cited references do not have an operating circuit that is directed to receive an operating configuration from operating circuit configurations internal to said operating circuit.

Therefore, independent claim 44 is patentable over McLeish in view of Sitte, as the inventions defined thereby are not suggested within either McLeish or Sitte, nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Accordingly, favorable reconsideration of claim 44 is respectfully requested.

Regarding independent claim 49, the applicants have amended claim 49 to more distinctly claim an interface circuit. In contrast to amended claim 49, the cited references, as stated above

in the responses to the 35 U.S.C. § 103 rejections of claims 1, 56, and 57, that McLeish and Sitte teach that more than a single external device are connected to their I/O interfaces. Therefore, independent claim 49 and its dependent claims 50-51 are at least patentable over McLeish in view of Sitte, as the inventions defined thereby are not suggested within either McLeish or Sitte, nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Consequently, claims 49-51 should be allowed over McLeish in view of Sitte. Accordingly, favorable reconsideration of claims 49-51 is respectfully requested.

5. The Examiner has rejected claims 66-72, 76-78 and 82 under 35 U.S.C. 103(a) as being obvious over McLeish in view of Sitte and in further view of Campau et al. (U.S. Patent No. 6,206,482, hereinafter Campau).

The Examiner asserts that:

As for claims 66 and 68, McLeish discloses the use of signal conditioning circuitry which, as known to those skilled in the art, may include a constant current circuit [col. 4, lines 48-58, "The signal conditioning... of keyboard 10."]. However, neither McLeish nor Sitte specifically disclose providing a constant current control circuit for controlling a current drawn by a load device. Campau teaches providing a constant current control circuit for controlling a current drawn by a load device, including a solenoid actuated valve [col. 2, line 58 — col. 3, line 7, "In prior art systems...the valve heating."].

The Examiner further asserts that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of McLeish and Sitte by adding a constant current control circuit for controlling a current drawn by a load device, in order to open or close a valve, as taught by Campau [col. 2, line 58 — col. 3, line 7, "In prior art systems... the valve heating."].

As for claim 67, McLeish discloses the interface of claim 66, said load device including a power level actuator in a process or machine [col. 9, lines 3-10, "The input output device.., data acquisition systems."].

As for claim 69, McLeish discloses the interface of claim 66, wherein said load device including an inductive load component, said constant current circuit being operative to reduce electromagnetic interference (EMI) and RFA (radio frequency interference) caused by energizing or de-energizing said load device [col. 9, lines 3-10, "The input output device.., data acquisition systems."].

As for claim 70, McLeish discloses the interface of claim 66, wherein said load device including a relay device [col. 9, lines 3-10, "The input output device.., data acquisition systems."].

As for claim 71, McLeish discloses the interface of claim 66, wherein said load device including a solenoid valve device [col. 9, lines 3-10, "The input output device...data acquisition systems."].

As for claim 72, McLeish discloses the interface of claim 66, wherein said constant current circuit eliminating the need for 10 suppression circuits to suppress turn-on and turn-off

mechanical shock to electromechanical devices and inductive loads [col. 9, lines 3-10, "The in put output device.., data acquisition systems."].

As for claim 76, McLeish discloses the interface of claim 66, wherein said load device including an inductive load component, 25 and said constant current circuit reducing destructive effects, both human and mechanical, of inductive L(di/dt) based transients that occur when de-energizing inductive loads [col. 9, lines 3-10, "The input output device.., data acquisition systems."].

As for claim 82, McLeish discloses the interface of claim 76, wherein said destructive effects include destructive mechanical effects to said inductive load containing device [col. 9, lines 3-1 0, "The input output device.., data acquisition systems."].

As for claim 77, McLeish discloses the interface of claim 77, wherein said destructive effects include destructive effects on humans in the vicinity of said inductive load containing device [inherent].

As for claim 78, McLeish discloses the interface of claim 66, wherein said load device includes or couples with a triac controlled by a triac control circuit, and said constant current circuit reduces half-cycle time delay in energizing and de-energizing current (ac) loads that otherwise occur with triac control circuits [col. 9, lines 3-10, "The input output device... data acquisition systems."].

The applicants respond to this rejection of claims 66-72, 76-78, and 82 by noting that claims 66-72, 76-78, and 82 depend directly or indirectly from amended independent claim 6. As a result, the applicants respectfully traverse the rejection of claims 66-72, 76-78, and 82 as

unpatentable over McLeish. These claims depend, either directly or indirectly, from claim 6 and are patentable at least on that basis. The rejection should therefore be withdrawn.

Moreover, the Campau reference is directed to an electronic brake management system, wherein the primary microcontroller 100 is at least connected to multiple valves 10 and multiple sensors 102-120 (see, for example, Fig. 1). Therefore, dependent claims 66-72, 76-78, and 82, which directly or indirectly depend from claim 6, are patentable over McLeish in view of Sitte and further in view of Campau, as the inventions defined thereby are not suggested within either McLeish, Sitte, or Campau, nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Consequently, claims 66-72, 76-78, and 82 should be allowed over McLeish in view of Sitte and further in view of Campau. Accordingly, favorable reconsideration of claims 66-72, 76-78, and 82 is respectfully requested.

6. The Examiner has rejected claims 73-75 under 35 U.S.C. 103(a) as being obvious over McLeish in view of Sitte in further view of Campau and in further view of Thomas et al. (U.S. Patent No. 4,267,439, hereinafter Thomas).

The Examiner asserts that:

As for claims 73-75, neither McLeish nor Sitte specifically disclose the use of an incandescent lamp in conjunction with a constant current circuit. Thomas discloses the use of an incandescent lamp in conjunction with a constant current circuit [abstract, "Incandescent lamps

are... operational lamp circuit."]. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of McLeish, Sitte and Campau by providing a constant current from a constant current circuit to an incandescent tamp, in order to extend the usable life of a controlled incandescent lamp, as taught by Thomas [abstract, "Incandescent lamps are...operational tamp circuit."].

The applicants respond to this rejection of claims 73-75 by noting that claims 73-75 depend directly or indirectly from amended independent claim 6. As a result, the applicants respectfully traverse the rejection of claims 73-75 as unpatentable over McLeish. These claims depend, either directly or indirectly, from claim 6 and are patentable at least on that basis. The rejection should therefore be withdrawn.

Moreover, the applicants find that the Thomas reference is directed to a document reader lamp life extension system, wherein a recognition processor is at least connected to a character scanning means 36, a quanitizer 61, a transition processor 62, picture buffer 64, and a sensor port 72 (see, for example, Fig. 11). Therefore, dependent claims 73-75, which directly or indirectly depend from claim 6, are patentable over McLeish in view of Sitte and further in view of Campau and further in view of Thomas, as the inventions defined thereby are not suggested within either McLeish, Sitte, Campau, or Thomas nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Consequently, claims 73-75 should be allowed over

McLeish in view of Sitte and further in view of Campau and in further view of Thomas. Accordingly, favorable reconsideration of claims 73-75 is respectfully requested.

7. The Examiner has rejected claim 80 under 35 U.S.C. 103(a) as being obvious over McLeish in view of Sitte and in further view of Galecki et al. (U.S. Patent No. 6,308,231, hereinafter Galecki).

The Examiner asserts that:

As for claim 80, neither McLeish nor Sitte specifically teach forming the interface on a single printed circuit substrate. Galecki teaches forming an I/O interface on a single printed circuit substrate [abstract, "According to another aspect, an integrated circuit... communication interface."]. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of McLeish and Sitte by forming the interface on a single printed circuit substrate, in order to simplify fabrication of the device.

The applicants respond to this rejection of claim 80 by noting that claim 80 depends indirectly from amended independent claim 6. As a result, the applicants respectfully traverse the rejection of claim 80 as unpatentable over McLeish. This claim depends indirectly from claim 6 and is patentable at least on that basis. The rejection should therefore be withdrawn.

Moreover, the applicants find that the Galecki reference is directed to an industrial control systems having input/output circuits that have an I/O circuit 50 that is electrically connected to at

least nine inputs and nine outputs that are decoded by a logic decoder 54 (see, for example, Fig. 3B).

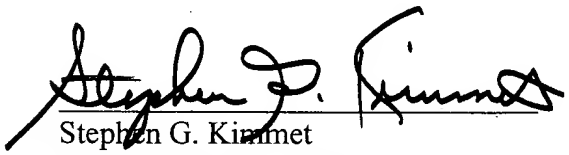
Therefore, dependent claim 80, which indirectly depends from claim 6, is patentable over McLeish in view of Sitte and in further view of Galecki, as the inventions defined thereby are not suggested within either McLeish, Sitte, or Galecki nor is there any suggestion or motivation to modify or combine these references' teachings in order to teach or suggest the claimed limitations, as required by 35 U.S.C. § 103. Consequently, claim 80 should be allowed over McLeish in view of Sitte and further in view of Galecki. Accordingly, favorable reconsideration of claim 80 is respectfully requested.

CONCLUSION

For all the reasons described in the preceding paragraphs, the applicants respectfully submit that the present application is now in condition for allowance. Accordingly, a timely action to that end is courteously solicited.

If the Examiner has any remaining questions or concerns, or would prefer claim language different from that included herein, the favor of a telephone call to the applicants' attorneys/agent is requested.

Respectfully submitted,



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